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17 COSATI CODES <table border="1"><tr><th>FIELD</th><th>GROUP</th><th>SUB-GROUP</th></tr><tr><td>15</td><td>02</td><td></td></tr><tr><td></td><td></td><td></td></tr></table>		FIELD	GROUP	SUB-GROUP	15	02					18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) OBLIGATIONS PUBLIC LAW 91-121 FY 82 CHEMICAL PUBLIC LAW 93-608 BIOLOGICAL	
FIELD	GROUP	SUB-GROUP										
15	02											
19. ABSTRACT (Continue on reverse if necessary and identify by block number) Public Law 93-608 requires the Department of Defense to make an annual report to Congress on the funds obligated for chemical warfare and biological defense research and procurement programs.												
REFLECTED MAY 8 1986 A												
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Block 1a. Report Security Classification: Designate the highest security classification of the report. (See DoD 5200.1-R, Chapters I, IV, VII, XI, Appendix A.)

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Block 2a. Security Classification Authority: Enter the commonly used markings in accordance with DoD 5200.1-R, Chapter IV, Section 4, paragraph 4-400 and 4-402. Indicate classification authority.

Block 2b. Declassification / Downgrading Schedule: Indicate specific date or event for declassification or the notation, "Originating Agency Determination Required" or "OADR." Also insert (when applicable) downgrade to _____ on _____ (e.g., Downgrade to Confidential on 6 July 1983). (See also DoD 5220.22-M, Industrial Security Manual for Safeguarding Classified Information, Appendix II.)

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Block 5. Monitoring Organization Report Number(s): Enter the unique alphanumeric report number(s) assigned by the Monitoring Agency. This should be a number assigned by a DoD or other government agency and should be in accordance with ANSI STD 239-23-74. If the Monitoring Agency is the same as the Performing Organization, enter the report number in Block 4 and leave Block 5 blank.

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Block 10. Source of Funding (Program Element, Project, Task Area, and Work Unit Number(s)). These four data elements relate to the DoD budget structure and provide program and/or administrative identification of the source of support for the work being carried on. Enter the program element, project, task area, work unit accession number, or their equivalents which identify the principal source of funding for the work required. These codes may be obtained from the applicable DoD forms such as the DD Form 1498 (Research and Technology Work Unit Summary) or from the fund citation of the funding instrument. If this information is not available to the authoring activity, these blocks should be filled in by the responsible DoD Official designated in Block 22. If the report is funded from multiple sources, identify only the Program Element and the Project, Task Area, and Work Unit Numbers of the principal contributor.

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If the report is in a foreign language and the title is given in both English and a foreign language, list the foreign language title first, followed by the English title enclosed in parentheses. If part of the text is in English, list the English title first followed by the foreign language title enclosed in parentheses. If the title is given in more than one foreign language, use a title that reflects the language of the text. If both the text and titles are in a foreign language, the title should be translated, if possible, unless the title is also the name of a foreign periodical. Transliterations of often used foreign alphabets (see Appendix A of MIL-STD-847B) are available from DTIC in document AD-A080 800.

Block 12. Personal Author(s): Give the complete name(s) of the author(s) in this order: last name, first name, and middle name. In addition, list the affiliation of the authors if it differs from that of the performing organization.

List all authors. If the document is a compilation of papers, it may be more useful to list the authors with the titles of their papers as a contents note in the abstract in Block 19. If appropriate, the names of editors and compilers may be entered in this block.

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Block 13b. Time Covered: Enter the inclusive dates (year, month, day) of the period covered, such as the life of a contract in a final contractor report.

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Block 15. Page Count: Enter the total number of pages in the report that contain information, including cover, preface, table of contents, distribution lists, partial pages, etc. A chart in the body of the report is counted even if it is unnumbered.

Block 16. Supplementary Notation: Enter useful information about the report in hand, such as: "Prepared in cooperation with . . ." "Translation at (or by) . . ." "Symposium . . ." If there are report numbers for the report which are not noted elsewhere on the form (such as internal series numbers or participating organization report numbers) enter in this block.

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Field - to indicate subject coverage of report

Group - to indicate greater subject specificity of information in the report

Sub-Group - if specificity greater than that shown by Group is required, use further designation as the numbers after the period (.) in the Group breakdown. Use only the designation provided by AD-624 000

Example: The subject "Solid Rocket Motors" is Field 21, Group 08, Subgroup 2 (page 32, AD-624 000)

Block 18. Subject Terms. These may be descriptors, keywords, posting terms, identifiers, open-ended terms, subject headings, acronyms, code words, or any words or phrases that identify the principal subjects covered in the report, and that conform to standard terminology and are exact enough to be used as subject index entries. Certain acronyms or "buzz words" may be used if they are recognized by specialists in the field and have a potential for becoming accepted terms. "Laser" and "Reverse Osmosis" were once such terms.

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For reference on standard terminology the "DTIC Retrieval and Indexing Terminology" DRIT-1979, AD-A068 500, and the DoD "Thesaurus of Engineering and Scientific Terms (TEST) 1968, AD-672 000, may be useful.

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If possible, the abstract of a classified report should be unclassified and consist of publicly releasable information (Unlimited), but in no instance should the report content description be sacrificed for the security classification.

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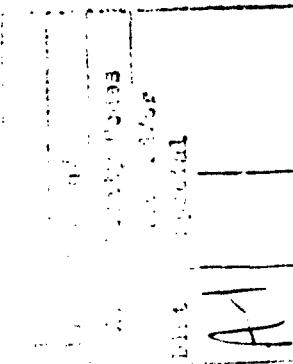
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DEPARTMENT OF THE ARMY
ANNUAL REPORT ON
CHEMICAL WARFARE - BIOLOGICAL PROGRAM OBLIGATIONS

RCS: DD-DR&E (SA) 1065

1982



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DEPARTMENT OF DEFENSE
 ANNUAL REPORT ON CHEMICAL WARFARE AND
 BIOLOGICAL RESEARCH PROGRAM OBLIGATIONS
 FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982
 RCS: DD-DR&E(SA) 1065

(ACTUAL DOLLARS)

	<u>ARMY</u>	<u>NAVY AND MARINE CORPS</u>	<u>AIR FORCE</u>	<u>TOTAL</u>
<u>CHEMICAL WARFARE PROGRAM</u>	146,672,000	27,872,000	24,423,000	198,967,000
R&TE	126,414,000	27,872,000	13,526,000	167,812,000
PROCUREMENT	20,258,000	0	10,897,000	31,155,000
<u>BIOLOGICAL RESEARCH PROGRAM</u>	21,554,000	0	0	21,554,000
R&TE	21,554,000	0	0	21,554,000
PROCUREMENT	0	0	0	0
<u>ORDNANCE PROGRAM</u>	29,731,000	0	0	29,731,000
R&TE	9,883,000	0	0	9,883,000
PROCUREMENT	19,848,000	0	0	19,848,000
<u>TOTAL PROGRAM</u>	197,957,000	27,872,000	24,423,000	250,252,000
R&TE	157,851,000	27,872,000	13,526,000	199,249,000
PROCUREMENT	40,106,000	0	10,897,000	51,003,000

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1. BIOLOGICAL RESEARCH

- a. Basic Research in Life Sciences
- b. Defense Research Sciences

2. DEFENSIVE SYSTEMS

- a. Exploratory Development
- b. Advanced Development
- c. Engineering Development
- d. Testing

DESCRIPTION OF PAA EFFORT FOR THE BIOLOGICAL RESEARCH PROGRAM

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SECTION I

OBLIGATION REPORT ON CHEMICAL WARFARE PROGRAM

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

DEPARTMENT OF THE ARMY

RCS: DD-DR&E (SA) 1065

DESCRIPTION OF RATE EFFORT FOR THE CHEMICAL WARFARE PROGRAM

During FY82, the Department of the Army obligated \$126,414,000 for general research investigations, development and test of chemical warfare agents, weapons systems and defensive equipment.

FUNDS OBLIGATED

	Current Fiscal Year (CFY)	\$ 125,771,000
	Prior Year (PY)	<u>643,000</u>
TOTAL	.	\$ 126,414,000

In-House	\$ 55,327,000
Contract	\$ 71,087,000

Breakdown of Program Areas

1. CHEMICAL RESEARCH

a. Basic Research in Life Sciences	CFY \$ 13,706,000 PY <u>114,000</u>	In-House \$ 5,823,000 Contract \$ 7,997,000
b. Exploratory Development	CFY \$ 13,820,000 PY <u>10,503,000</u>	In-House \$ 6,031,000 Contract \$ 4,472,000
TOTAL: CHEMICAL RESEARCH	CFY \$ 114,000 PY <u>24,209,000</u>	In-House \$ 11,854,000 Contract \$ 12,469,000

2. LETHAL CHEMICAL PROGRAM

a.	Exploratory Development	CFY \$ 11,623,000 PY <u>-0-</u>	In-House \$ 7,456,000 Contract \$ 4,167,000
b.	Advanced Development	CFY \$ 10,034,000 PY <u>-0-</u>	In-House \$ 3,674,000 Contract \$ 6,360,000
c.	Engineering Development	CFY \$ 10,034,000 PY <u>-0-</u>	
d.	Testing	CFY \$ 115,000 PY <u>-0-</u>	In-House \$ 115,000 Contract \$ -0-
TOTAL: LETHAL CHEMICAL PROGRAM		CFY \$ 21,772,000 PY <u>-0-</u>	In-House \$ 11,245,000 Contract \$ 10,527,000

3. INCAPACITATING CHEMICAL PROGRAM

	CFY	\$	1,060,000	
	PY		<u>-0-</u>	
a. Exploratory Development		\$	1,060,00	In-House \$ 407,000 Contract \$ 653,000
b. Advanced Development		\$	<u>-0-</u>	
c. Engineering Development		\$	<u>-0-</u>	
d. Testing		\$	<u>-0-</u>	

TOTAL : INCAPACITATING CHEMICAL PROGRAM

	CFY	\$	1,060,000	
	PY		<u>-0-</u>	
		\$	1,060,000	In-House \$ 407,000 Contract \$ 653,000

4. DEFENSIVE EQUIPMENT PROGRAM

a. Exploratory Development

(1) Physical Protection Investigations	CFY	\$	7,804,000	
	PY		<u>-0-</u>	
		\$	7,804,000	In-House \$ 3,948,000 Contract \$ 3,856,000

(2) Warning and Detection Investigations	CFY	\$	7,751,000	
	PY		<u>-0-</u>	
		\$	7,751,000	In-House \$ 3,398,000 Contract \$ 4,353,000

(3) Medical Defense Against Chemical Agents

CFY \$ 22,320,000
PY <u>529,000</u>
<hr/>
In-House \$10,846,000
Contract \$12,003,000
<hr/>
\$ 22,849,000

TOTAL: Exploratory Development

CFY \$ 37,875,000
PY <u>529,000</u>
<hr/>
In-House \$18,192,000
Contract \$20,212,000
<hr/>
\$ 38,404,000

b. Advanced Development

(1) Defensive Systems

CFY \$ 17,981,000
PY <u>-0-</u>
<hr/>
\$ 17,981,000

(2) Medical Defense Against Chemical Agents

CFY \$ 20,104,000
PY <u>-0-</u>
<hr/>
\$ 2,123,000

TOTAL: Advanced Development

CFY \$ 20,104,000
PY <u>-0-</u>
<hr/>
In-House \$ 6,022,000
Contract \$14,082,000
<hr/>
\$ 320,104,000

c.	<u>Engineering Development</u>			
	(1) Decontamination Concepts and Material	CFY PY	\$ 1,036,000 -0-	In-House \$ 568,000 Contract \$ 468,000
	(2) Collective Protective Systems	CFY PY	\$ 8,280,000 -0-	In-House \$ 1,232,000 Contract \$ 7,048,000
	(3) Warning and Detection Equipment	CFY PY	\$ 1,038,000 -0-	In-House \$ 430,000 Contract \$ 608,000
	(4) Individual Protection Equipment	CFY PY	\$ 7,342,000 -0-	In-House \$ 2,985,000 Contract \$ 4,357,000
	TOTAL: Engineering Development	CFY PY	\$ 17,696,000 -0-	In-House \$ 6,215,000 Contract \$ 12,481,000

d. Testing

(1) Material Tests in Support of
Joint Operational Plans/
and/or Service Requirements

(2) Army Material Suitability
Tests

	CFY	\$	885,000
	PY		-0-
		\$	885,000
		In-House	\$ 885,000

TOTAL: Testing

	CFY	\$	885,000
	PY		-0-
		\$	885,000
		In-House	\$ 885,000

TOTAL: DEFENSIVE EQUIPMENT PROGRAM

	CFY	\$	76,560,000
	PY		529,000
		\$	77,089,000
		In-House	\$ 314,000

5. TRAINING SUPPORT

a. Training	CFY	\$	869,000
	PY		-0-
		\$	869,000
b. Suitability Tests	CFY	\$	76,000
	PY		-0-
		\$	76,000
		In-House	\$ 76,000

TOTAL: TRAINING SUPPORT

	CFY	\$	869,000
	PY		-0-
		\$	869,000
		In-House	\$ 857,000

	CFY	\$	857,000
	PY		12,000
		\$	857,000
		In-House	\$ 857,000

6. SIMULANT TEST SUPPORT

CFY	\$ 1,301,000
PY	\$ -0-
	<hr/>
TOTAL:	\$ 1,301,000

TOTAL: SIMULANT TEST SUPPORT

In-House	\$ 650,000
Contract	\$ 651,000

EXPLANATION OF OBLIGATION

1. CHEMICAL RESEARCH

a. Basic Research in Life Sciences

This research provides a science base in support of:

- (1) Chemical Defense. Program includes new concepts and the explanation of mechanisms related to decontamination and contamination avoidance, collective and individual protection, chemical detection, identification and alarms, material research, simulants and training systems.
- (2) Chemical Deterrence. Program includes a search for new classes of chemical agents, investigations of chemical agent properties and reactions, and research related to chemical munitions.

During FY82:

Theoretical studies were completed of non-Newtonian liquid flow into capillary tubes used in viscosity measuring theoretical devices. Initial results of computer simulation of liquid decontamination processes revealed the strong effects of viscosity on contaminant movement.

An experimental surface decontamination device was fabricated to produce reactive molecules in high temperature gas streams, and experiments were begun to assess their effectiveness in surface decontamination.

Micromulsions were studied for possible use as a universal water-based decontaminant. Two systems which are stable to typical decontamination conditions have been characterized through phase diagrams and light scattering measurements.

The effects of humidity, particle size irregularities, bed depth dispersion and diffusion in shallow bed carbon filters were evaluated in terms of height equivalent to a theoretical plate, breakthrough time, and adsorption capacity.

Supplemental work was performed by the Naval Research Laboratory to understand the factors responsible for environmental "aging" on charcnal lifetime and effectiveness.

Visible spectrometry and photometric densitometry were investigated as possible techniques for conducting chromogenic gas-solid reaction studies using chemical warfare (CW) agents as the gas-phase reactants.

The literature was reviewed of work conducted since 1950 on oximes as direct-acting chromogenic reagents for detection of G-agents. Based on this review, stability and reactivity studies of two oximes, diisopropenyoacetone (DIA) and ethyl michler's ketone oxime (EMKO) were proposed for FY83.

Mathematical models were formulated to relate the physical characteristics of a chemical compound to its structure so that new simulants may be found that will match the properties of the target compound.

Immersion studies of neoprene were conducted during the year using varied combinations of a chemical warfare decontamination solution.

Molecular orbital calculations were completed which will be used to help identify a pharmacophore for a series of azabutadiene and related chemicals.

A specially instrumented canister was designed and constructed for use in studying the fluid mechanics characteristic of spinning, coning viscous liquids.

A high temperature reactor was assembled and used to make viscometric measurements on thickened solutions.

Medical Aspects of Chemical Defense: This program is a rapidly growing effort to develop systems of antidotes, medical management of the chemical warfare casualty, and rapid decontamination for the Army, Navy and Air Force. The overall objective is to insure combat effectiveness, mission accomplishment and soldier survivability in an environment where hostile forces employ conventional, chemical, and nuclear weapons.

The basic objectives for this research are:

Establish a solid foundation for future chemical defense capabilities.

Define the mechanisms of the effects of agents to develop new and improved antidotes.

Define the mechanisms of the effects of antidotes to establish a basis for self-aid, and subsequent medical treatment of casualties.

The objectives of military decontamination studies are to determine the mode of actions of chemical warfare agents and decontaminants on and in the skin; and to acquire the knowledge required to perform effective decontamination.

During FY82:

Developed a standard model for evaluating specific effects of CW agents and antidotes.

Documented effects of CW agents on nervous system and other vital body systems.

Produced monoclonal antibodies as a tool for studying distribution of CW agents in the body.

Examined the metabolic fate of potential CW antidotes.

Developed a radioactive assay procedure for evaluating the effects of CW agents.

Correlated the difference in the systemic effect of CW agent simulants and actual CW agents.

b. Exploratory Development

Chemical/Biological Threat Assessment Technology: The objective is to identify the needs for improved US chemical and biological defensive measures and capabilities. Results will be the establishment of analytical technology and the data base required to evaluate foreign capabilities. This effort will identify requirements affecting all other technical areas.

During FY82:

Chemical Systems Laboratory supplied technical assistance to other defense organizations which are incorporating chemical effects into their models and wargames.

A contract was initiated to study the vapor absorption into materials commonly found inside urban structures.

A model was completed to estimate the distribution of liquid agents on stationary and moving vehicles.

A computerized storage and retrieval system for chemical models is being developed which will accommodate data on foreign systems.

Chemistry of Threat Agents and Chemical Technology: The objective is to identify, synthesize, assay, and study the properties of chemical compounds posing a threat to the US chemical defensive posture, and to maintain an up-to-date technology in immunochemistry, chemometrics, and analytical chemistry in support of chemical defense investigations.

Toxicological Effects of Threat Agents and Chemicals of Mission Interest: The objective is to determine and evaluate the toxicities of threat agents and various chemicals of mission interest.

During FY82:

A model based on exposure times to 50 concentrations was developed to determine the exposure time related to concentration that would produce miosis.

Inhalation studies with a related threat agent in guinea pigs, mice and rats were initiated

Acute toxicity evaluations on mice were conducted.

New automated techniques for measuring pulmonary functions were put into use and a modified miniture agent exposure chamber was developed, calibrated, and employed.

Facility upgrade has been initiated to satisfy requirements of stringent surety, safety, and environmental control regulations for using inhalation chambers with threat compounds.

Chemical Systems and Procedures Technology: The objective is to quantify the mechanisms and processes that control the operational performance of chemical defensive and deterrent systems.

During FY82:

A comparative study was made of the efficacy of powdered sorbents for reducing liquid contamination levels on personnel protective garments.

The role of elevated temperatures and air velocities was investigated for minimizing residual contamination on such garments.

The hazard presented by agents remaining in paint films following decontamination or weathering was defined.

Toxicological trials with mustard agent were completed.

The effects of high concentration clouds of battlefield particulates on protective face masks were evaluated to establish the conditions at which accumulated material affected personnel or mask performance.

Chemical Training and Trialing Agents and Equipment: The objective is to provide simulant agents and disseminating devices to train individuals and units to survive in a chemical warfare environment to provide detection and decontamination equipment training aids; and to provide simulant trialing agents for assessment of CW defensive equipment and procedures.

During FY82:

The Navy Medical Command and the Air Force Medical Department issued formal use approvals for polyethylene glycol (PEG 200), a simulant agent, butyl mercaptan (BUSH), and fluorescent tracers for training of their forces.

A search was initiated for alternative fluorescent tracers.

A Navy Medical Command approved training simulant was tested and found to be an eye irritant.

A simulant agent/decontamination system was developed.

The use of BUSH as a vapor simulant was promoted by providing free samples to units in the field.

Toxin Defense Technology and Systems: The objective is to evolve improved concepts for defense against biological toxins in military operations; to evaluate fielded and developmental CB defense materiel for effectiveness against toxins; to identify gaps in available data and materiel for toxin defense; and to provide a technology base and facilities for development of toxin defense materiel.

During FY82

A preliminary assessment of the capabilities of existing equipment against the trichothecene mycotoxin, T-2, was conducted. The effectiveness of CB protective clothing, the skin decontamination kit and various decontaminants against solutions of this mycotoxin was determined. The T-2 mycotoxin detection capabilities of the chemical agent detector kits and the liquid chemical agent detector papers were evaluated.

Available analytical procedures for the detection and quantitative analysis of trichothecene mycotoxins were investigated and a simplified fluorescent assay method was developed.

The design of a toxin containment facility capable of aerosol work was completed and procurement of equipment initiated.

2. LETHAL CHEMICAL PROGRAM

a. Exploratory Development

Lethal Chemical Agents/Weapons: The objective is to provide the US with a credible lethal chemical agent deterrent capability.

During FY82:

Exploratory development continued on binary intermediate volatility agents (IVA).

Investigations continued for improved binary chemical agent intermediates and dual-purpose binary agents. A chemometrics analysis and modeling program was initiated to aid in identifying new lethal agents to be synthesized and tested.

A binary and mixed binary agent toxicity screening program was successfully completed.

Progress continued with binary munitions concepts:

A 1/4-length spinning reactor which simulates the chemical warhead for the Multiple Launch Rocket System (MLRS) was completed. Results indicate excellent mixing of the components.

Preliminary work on a medium altitude proximity fuze was successful. Advanced development began in June 1982.

Confirmation tests on the 155mm IVA projectile were completed.

In-house design and work on a binary chemical agent submunition/mine to be ejected from a dispenser has resulted in a proven prototype. A contract has been awarded to refine the prototype design, develop the fuzing, and conduct tests from a dispenser.

In-house design and system analysis studies continued on extended range artillery projectiles, division support weapons systems, and several missile systems.

Chemical Agent Process Technology: The objective is to evolve processing concepts for riot control agents, lethal agents, and binary intermediates.

During FY82:

Comparative process evaluation studies for manufacture of binary intermediates continued with laboratory scale evaluation of three processes and the identification of four other processes to be studied during FY83. Potential commercial sources of the binary intermediates have been identified.

A candidate riot control material was made in the laboratory to further define the process for scale up.

A contract was awarded to continue process development efforts for binary intermediates on an expanded pilot scale. Mechanical process development for filling and closing munitions systems are included in the study.

b. Advanced Development

Tactical Weapons Systems:

During FY82:

Advanced development of a medium altitude proximity fuze was initiated in June 1982.

Advanced development of a chemical warhead for the Multiple Launch Rocket System (MLRS) was initiated in November 1981. The design of the warhead and a preliminary technical data package for the warhead were completed. Agent characterization tests were conducted in the 1/4-length spin reactor. Integration, design, development, and testing of the concept definition hardware were conducted.

Advanced development was initiated on an 8-inch IVA projectile. Prototypes were designed and fabricated. Developer tests were conducted. Future efforts were terminated by the Department of Defense.

c. Engineering Development

Material Tests in Support of Joint Operational Plans and/or Service Requirements: No obligations were incurred.

d. Testing

Lethal Chemical Ground Munition: A design confirmation test of the 155mm IVA projectile was conducted at Dugway Proving Ground. 55 simulant-filled projectiles were successfully fired. The projectile is ready to enter engineering development.

3. INCAPACITATING CHEMICAL PROGRAM

a. Exploratory Development

Incapsulating Chemical Agents/Weapons: The objective is to discover and evaluate incapacitating chemicals, as well as munition devices for their delivery.

During FY82:

Emphasis continued on developing physically incapacitating agents that are effective by inhalation or absorption through the skin. A structure-activity relationship study was initiated on a new class of compounds with focus on increasing both the safety ratio and the incapacitating effects.

A preliminary study on the ability of liquids to penetrate fabric by a liquid breakthrough mechanism was completed. Good results were obtained with a mixture of solvents against particular fabric.

Two studies were initiated to improve the design of pyrotechnic projectiles for delivering incapacitating agents. One study examined a proposed new design for reducing the cost of the submunition system for a 155mm projectile. The other investigated an improved fuze system.

b-d. Advanced Development; Engineering Development; Testing

No obligations were incurred.

4. DEFENSIVE EQUIPMENT PROGRAM

a. Exploratory Development

(1) Physical Protection Investigations

Chemical and Biological Decontamination and Contamination Avoidance: The objective is to investigate procedures, designs and materials which avoid chemical, biological and radiological contamination. Studies support the development of methods of minimizing contamination, and the development of materials and equipment for the decontamination of personnel and materiel.

During FY82:

A systems analysis study of current and developmental decontamination systems and procedures was completed.

Investigations were initiated on the possibility of bonding oxidation catalysts to polymer backbones for the purpose of creating a self-decontaminating paint.

Agent tests to determine the factors controlling the transfer of agent from one surface to another were continued, as well as studies on the possible use of corona discharge to effect chemical or biological decontamination.

A contract to evaluate water-based decontaminants to replace the standard decontaminating solution was awarded.

Chemical Protection Technology: The objective is to evolve improved concepts, methods, and materials for individual and collective protection against all potential threat agents for tri-service application, and to insure occupational health and safety in industrial operations.

During FY82:

Awarded contracts for prototype definition of high performance aircrew protective mask.

Completed draft report on overgarment surveillance data and for powered respiratory system. Developed prototype rapid-doff overgarment.

Completed conceptual models of alternate design mask for XM30 development.

Awarded contract on FY82 corona discharge concepts for air purification.

Completed litter patient entry/exit tests. Completed entry/exit procedure test for command post structures.

Initiated evaluation of protective capability of standard and development canisters against known penetrants.

(2) Warning and Detection Investigations

Chemical Detection and Identification Technology: The objective is to evolve new concepts for the development of equipment for detecting and identifying chemical agents in air, water, and on surfaces.

During FY82:

Development of Nuclear/Biological/Chemical (NBC) reconnaissance system was continued. A tandem mass spectrometer was purchased and installed. Studies have been initiated to reduce the size, weight, and power requirements of the instrument and a sampling probe for the mass spectrometer is being fabricated.

Models of markers to delineate areas of contamination have been fabricated. An articulating arm has been designed, fabricated, and mounted on the test bed vehicle. It is being evaluated for utility in taking surface samples at a distance from the vehicle by an operator who does not exit from the NBC Reconnaissance System.

I.: studies to increase the sensitivity of detection tests for agent in water, an enzyme system using eel cholinesterase was demonstrated to have the required sensitivity. Several compounds have been synthesized for the direct detection of mustard. However, most of these do not have the required sensitivity. Several compounds are being studied to accelerate the reaction.

Chemical Alarm Technology: The objective is to broaden the capability of alarms to detect new agents; increase system effectiveness by decreasing the logistics burden; develop a remote sensing capability; provide a ground surveillance and contamination monitor capability; and improve the means for disseminating the warning of a chemical attack.

During FY82:

Initiated evaluation of factors affecting contamination monitoring; initiated multi-year contracts in infrared and ultraviolet technology; began multi-year remote sensing new concepts contract; initiated initiation of design characteristics and design trade-offs for an NBC ground reconnaissance system and an NBC aerial reconnaissance system.

Performed review of alarms in US and allied nations; initiated effort to exploit potential of portable mass spectrometry.

Began Personal Automatic Liquid Agent Detector and individual chemical agent alarm/dosimeter contracts.

Provided consultant services to project managers in establishing chemical agent detection and warning capability for vans and shelters.

(3) Medical Defense Against Chemical Agents

The objectives are:

Develop minimally acceptable tolerance thresholds for CW agent and antidote.

Develop pretreatment, prophylactic, antidote and therapeutic drugs that will assure soldier protection and operational capability in a CW environment.

Establish decontamination criteria, explore and assess new technologies, and convert biological data to medical and engineering criteria to determine the level of decontamination required to provide support, safety and survivability.

Develop criteria for threshold limits of performance and for physiological burden imposed by the decontamination and medical systems.

Develop and assess new biomedical engineering approaches and design concepts for use in decontamination and detoxification of military medical materiel

Develop a total system of medical management (triage, diagnosis, resuscitation, treatment, life support management, and evacuation) in a CW environment.

Develop methods for protection of medical supplies and equipment, detoxification, emergency far forward medical treatment, resuscitation, evacuation, and follow-on treatment of mass CW casualties.

During FY82:

Established the efficacy of currently fielded anti-CW drugs; established standards for the evaluation of potential anti-CW compounds; determined various direct and indirect effects of CW agents on selected organ functions; developed stable reference agents to be used as standards for comparing research results; developed a simple test to determine durability of diluted solutions of CW agents; established protective characteristics and effects of several candidate anti-CW compounds; continued chemical analysis and toxicity studies on various candidate anti-CW compounds.

Found candidate anti-CW compounds which may reverse the behavioral and incapacitating effects of CW agents; determined sublethal doses of CW agents for use in chronic studies; studied the correlation of sensory information with exposure to CW agents and anti-CW compounds; screened potential anti-radiation compounds using new established biomimetic models; determined the effects of anti-CW drugs on behavior and performance; determined the relationship of daily rhythms and exposure to CW agents.

Compared the auxiliary cooling capabilities of air-cooled versus water-cooled vests; developed an animal model for skin injury due to CW agents; identified potential materials for chemical hardening of medical equipment; evaluated prototype patient decontamination system.

Conducted feasibility studies with the US Air Force to determine the most viable approaches to field resuscitation of CW casualties; demonstrated that components of the M258 Kit are skin irritants; continued mutagenicity testing of potential anti-CW compounds; and proposed several casualty care modeling systems for incorporation into military field medicine programs of instruction.

b. Advanced Development

(1) Defensive Systems

Chemical Decontamination Material: The XM13 Decontaminating Apparatus has been designed to dispense standard chemical agent decontaminating solution (DS2). It is man portable and manually operated to decontaminate those areas of the equipment which are needed for normal operations and maintenance.

Decontaminating Apparatus, Portable: Interior, Vehicles and Shelters, XM15: The Interior Surface Decontamination System (ISDS) will provide the Army with the ability to decontaminate chemical and biological warfare agents on the interior surfaces of vehicles, vans, shelters, aircraft and watercraft. The ISDS will be designed to reduce the contamination so that personnel may be able to remove the protective mask, the butyl rubber gloves, or unbutton the protective overgarment. This ability is vital in order to relieve the heat stress imposed by the wearing of CB protective clothing and mask. A design using hot air was selected for further development.

Decontaminating Apparatus, Truck Mounted, Jet Exhaust, XM16: There is a need for a decontamination apparatus to reduce NBC contamination rapidly and effectively on combat vehicles. The vehicle crews can then reduce the amount of protective clothing worn and thereby increase their ability to fight more effectively. There is also a requirement for a system to produce large area screening smoke.

The XM16 Jet Decontaminating Apparatus consists of a J60-P-1 jet engine mounted on a hydraulic turntable. The jet engines can be vertically and horizontally moved to disperse hot exhaust gases over the surfaces of the contaminated vehicle. An injection nozzle is located at the engine's exhaust for injecting water, decontaminating liquids or smoke producing liquids. Under the advanced development contract, the model design and the fabrication of three units were completed. The J60-P-6 jet engines were modified to use diesel fuel instead of jet fuel. This eliminates the problem of supplying jet fuel to the field and reduces the operating costs of the unit. Road and decontamination tests have been completed.

Collective Protection Equipment: NBC, Simplified, XM20: The project will develop low-cost, easily transportable equipment for converting a room of an existing building into a positive pressure collective protection shelter for ten people. Engineering design tests were completed.

Chemical Detection and Warning Material:

The Automatic Liquid Agent Detector (ALAD) is being developed to detect at a point source single droplets of liquid and thickened agents, and trigger an alarm to alert troops. The detector, which will provide 24-hour liquid chemical agent detector capability, is in the early stages of development.

The Scan Infrared Remote Alarm, Chemical, XM21 (SCI-REACH) is being developed to detect from remote positions approaching chemical agent clouds. Remote sensing provides

increased time to take defensive positions, reduces casualties and maintains an effective combat force during chemical agent attack. Decision was made to redesign the alarm, including the microprocessor, to weigh 34-45 pounds.

The Water Testing Kit, Chemical Agents, XM272, is being developed to provide a simple reliable kit that will detect hazardous levels of nerve, mustard, Lewisite, and blood agents in water. It will be lightweight, compact, storage stable, expendable, and easy to use. The advanced development has been so successful that the engineering development phase may be eliminated and the kit type classified.

The Automatic Chemical Agent Alarm, XM22, is based on an ion mobility spectrometry concept. The detector will possess improved sensitivity over existing alarm systems. It responds to a wider selection of agents, and possesses a ground surveillance detection capability. Tests showed good results for both point sampling and surface contamination monitoring. Advanced development contract was initiated.

(2) Medical Defense Against Chemical Agents

Objectives for advanced development include:

- (a) Advanced chemical and radiation antidote development -- Establish kinetic relationships that will permit the formulation of retreatment and therapeutic drugs with a maximum stability and efficacy with a minimum of side effects. This development will be used to support a new drug application with the Federal Drug Administration. Seek advanced development of chemotherapy and medical concepts that will prevent or minimize injury due to CW agent. Seek advanced development of means to prevent, mitigate, and treat the effects of ionizing radiation.
- (b) Advanced life support equipment development -- Verify the initial design and engineering efforts expended in the system concept development phase. Document and resolve any logistical and technical problems of advanced development system. Determine for equipment and systems the technical feasibility, operational effectiveness, military utility, and ultimate cost.

During FY82:

Initiated studies on determining the stability of selected anti-CW compound in storage and therapy modes.

Determined that a promising anti-radiation drug in oral formulation provided longer radiation protection than that afforded by intraperitoneal administration of the same compound.

Initiated prototype development of an upgraded CW protective patient wrap.

Initiated an advanced development effort of vital signs monitor to be used at a battalion aid station for triage of casualties robed in chemical protective garments.

Initiated a cooperative contractual effort with the Air Force for the development of a gas-powered individual resuscitator.

c. Engineering Development

(1) Decontamination Concepts and Material

Decontamination Apparatus, Diesel Powered Skid Mounted, XM18, replaces the M12A1 Power Driven Decontaminating Apparatus. It will mix and dispense decontaminants, water and water based cleaning solutions to decontaminate equipment, personnel and terrain. Planned M12A1 product improvements were incorporated into the engineering development program.

(2) Collective Protective Systems

Modular Collective Protection Equipment (MCPE): The MCPE provides protection against known CB threat agents for vehicles, vans and shelters through the use of standard items of supply. An additional 21 systems were identified to bring the total to approximately 75 van shelter systems requiring CB protection.

(3) Warning and Detection Equipment

Chemical Detection, Warning and Sampling Development: The XM207 Chemical Attack Warning and Transmission System provides a visual and audible signal to alert military personnel of the presence of toxic agents or the imminence of CB attack. The signal is a cylindrical, self-contained, hand-fired munition. Preliminary Independent Evaluation

Report recommended termination of the project because of poor audibility for combat personnel wearing full chemical protective garments.

Simulator, Detector Unit, Chemical Agent, Automatic Alarm, XM81: This unit helps to train troops to respond to an M8 Alarm in a simulated chemical attack. Combined development and operational tests were started in April 82.

Simulator, Detector Tickets, Chemical Agent, Training, M256 (TRAINS I): The M256 Kit has been engineered to give positive or negative tests, giving users training in operation and interpretation of results. The contractor has completed fabrication of the hardware and development tests have begun.

(4) Individual Protection Equipment

New Protective Mask: The XM30 mask provides respiratory, eye, and face protection against chemical and biological agents.

During FY82:

The development of the XM30 mask for the Army was terminated by the Vice Chief of Staff, US Army, July 1982. However, the Army agreed to fund completion of engineering development of the XM30 mask for the Air Force and the Navy through 31 December 1982. The developmental and operational testing were completed. It was concluded that the flexible lens provided no significant improvement in operational effectiveness and it was not sufficiently durable for the Army's operational environment. Both the Air Force and the Navy remain interested in the improved fit and vision of the XM30 mask and continued operational testing. Minimum essential engineering development tasks were accomplished which were necessary to permit the Air Force and the Navy to make a production decision regarding the XM30 mask by 31 December 1982.

A follow-on development program was initiated to combine the positive features of the XM30 mask with the durable, rigid lens system of the standard M17A1 mask.

d. Testing

(1) Material Tests in Support of Joint Operational Plans and/or Service Requirements
--

No obligations were incurred.

(2) Army Material Suitability Tests

Chemical Systems Laboratory has funded Dugway Proving Ground to conduct a major portion of the Development Testing II program for the XM30 protective mask. A risk analysis of the performance of the masks will be made before completion of all testing. This risk analysis will be based on the designated high risk subtests of initial performance, sanitization and decontamination, and adverse environments.

5. TRAINING SUPPORT

a. Training

Simulator, Projectile, Airburst, Liquid XM11 (SPAL): The SPAL is a training airburst device designed to simulate an artillery chemical agent attack. The SPAL is launched from the Liquid Airburst Projectile Launcher. Disseminated droplets are detected on paper on the soldier's outer garment. Development tests were successfully completed. Type classification is scheduled for March 1983.

Non-Explosive Dissemination Device for Thickened Liquid Simulant Agents: The device is a slightly modified M5 Riot Control Agent Dispenser and can be used either from a helicopter or a ground vehicle to disperse thickened liquid simulant agents for training purposes. Type classification is scheduled for Nov 85.

b. Suitability Tests

Aerial spray tests for thickened liquid simulant agents were performed at Dugway Proving Ground.

6. SIMULANT TEST SUPPORT

Chemical Logistics Evaluation: This test evaluates the current US Marine Corps Chemical Weapons and Support Systems. During FY82 two simulant dissemination trials were conducted and the data analyzed.

Material/Terrain Decontaminant Evaluation: This test evaluates decontaminant effectiveness on a variety of military equipment surfaces. To date, polyurethane and alkyd painted surfaces, canvas, bare metals and aircraft materials of construction have been tested under a range of temperatures to determine decontamination effectiveness. During FY82, twenty-four trials were conducted under controlled conditions. Helicopter materials will be tested in FY83, completing the project.

Aircraft Operations - Toxic Environment: This test evaluates the hazards associated with aircraft operations under both ground and flight conditions while in a toxic environment and evaluates techniques for decontamination. Testing was initiated in August 1982 and sixty trials using multi-engine aircraft have been conducted. Testing will continue into FY83.

Mission Degradation Associated with Chemical Protection: This test evaluates the degradation of combat performance of US Troops when wearing protective clothing and performing a variety of functions associated with mission requirements. A number of scenarios will be tested covering operational units while in battle dress uniform and under mission oriented protective posture configuration. Testing will begin in FY83.

Assessment of Toxic Environment: This study defines the potential toxic environment produced by chemical agents identified as agents of threat to US forces. Assessments have been made on vapor concentration, density and agent distribution on targets attacked with several types of chemical weapons under various meteorological conditions. Study will be completed in FY83.

Effects of Decontaminant on Air Defense Equipment: This study evaluate the effects of decontaminants on air defense equipment and make recommendations for testing requirements in the future. Study is scheduled for completion 3QFY83.

Maintenance Operations in a Chemical Contaminated Environment: This study evaluates the effects of a persistent chemical agent attack on representative type of maintenance operations. Testing will begin in FY83.

Effectiveness of Missiles Against Ships: This study assesses the threat to the US Naval forces when subjected to an attack from chemical weapon systems. Assessments will be made of the effectiveness of chemical filled munition systems, compared to high explosive munition systems, against ships at sea. Study will be completed in FY83.

Simulant Review and Selection: This project is a continuing effort designed to develop a spectrum of test materials to be used to simulate agent behavior for use in the field testing. Major emphasis was on the development of sampling and assaying methods for the simulants being used in the aircraft operations - toxic environment test.

DESCRIPTION OF PAA EFFORT FOR THE CHEMICAL WARFARE PROGRAM

During FY82 the Department of the Army obligated \$20,258,000 for procurement of weapons systems, defensive equipment and production base projects.

FUNDS OBLIGATED

	<u>FUNDS OBLIGATED</u>
Current Fiscal Year (CFY)	\$ 16,143,000
Prior Year (PY)	<u>\$ 4,115,000</u>
TOTAL	\$ 20,258,000

In-House	\$ 7,079,000
Contract	\$13,179,000

Breakdown of Program Areas

1. LETHAL CHEMICAL PROGRAM

a. Item Procurements	\$ -0-
b. Production Base Projects	CFY PY
	<u>\$ 380,000</u>
	<u>-0-</u>
	\$ 380,000

2. INCAPACITATING CHEMICAL PROGRAM

a. Item Procurements	\$ -0-
b. Production Base Projects	\$ -0-

3. DEFENSIVE EQUIPMENT PROGRAM

a. Item Procurements

(1) Decontaminating Apparatus	CFY PY	\$ 114,000 <u>-0-</u>	In-House \$ 114,000 Contract \$ -0-
(2) M8-M10 Chemical Agent Alarm	CFY PY	\$ 114,000 <u>-0-</u>	In-House \$ 114,000 Contract \$ -0-
(3) M51 Shelter System	CFY PY	\$ 438,000 <u>438,000</u>	In-House \$ 438,000 Contract \$ -0-
(4) Modular Collective Protection	CFY PY	\$ 19,000 <u>19,000</u>	In-House \$ 19,000 Contract \$ -0-
(5) M24 Mask	CFY PY	\$ 313,000 <u>1,945,000</u>	In-House \$ 313,000 Contract \$ 1,945,000
(6) M25A1 Mask	CFY PY	\$ 2,258,000 <u>2,258,000</u>	In-House \$ 4,603,000 Contract \$ -0-
(7) M17A1 Mask	CFY PY	\$ 9,717,000 <u>2,000</u>	In-House \$ 9,719,000 Contract \$ 9,646,000

b. Production Base Projects

		CFY	\$ 1,000,000	
		PY	\$ -0-	In-House \$ -0-
(1)	MMT New Protective Mask			
		CFY	\$ 1,000,000	In-House \$ 1,000,000
		PY	\$ -0-	Contract \$ -0-
(2)	MMT Impregnated Charcoal			
		CFY	\$ 106,000	In-House \$ 106,000
		PY	\$ -0-	Contract \$ -0-
(3)	MMT Remote Sensing System			
		CFY	\$ 300,000	In-House \$ 120,000
		PY	\$ -0-	Contract \$ 180,000
TOTAL :	<u>DEFENSIVE EQUIPMENT PROGRAM</u>	CFY	\$ 15,763,000	
		PY	\$ 4,115,000	In-House \$ 6,879,000
				Contract \$ 12,999,000

EXPLANATION OF OBLIGATION

1. LETHAL CHEMICAL PROGRAM

- a. Item Procurements
No obligations were incurred for procurement of lethal chemical items.
- b. Production Base Projects
Obligations incurred to establish waste disposal technology for the M687 binary projectile.

2. INCAPACITATING CHEMICAL PROGRAM

- a. Item Procurements
No obligations were incurred for procurement of incapacitating chemical items.
- b. Production Base Projects
No obligations were incurred for production base projects in support of incapacitating chemical program.

3. DEFENSIVE EQUIPMENT PROGRAM

- a. Item Procurements
 - (1) Decontaminating Apparatus
Obligations incurred for procurement of the M12A1 decontaminating apparatus.
 - (2) Alarm, M8-M10, Chemical Agent
Obligations incurred for in-house engineering support of chemical agent alarms used to detect chemical agents.
 - (3) Shelter System, M51
Obligations incurred for in-house engineering support of M51 shelter used to provide CB protection to field units.
 - (4) Modular Collective Protective Equipment
Obligations incurred for procurement and product improvement of modular collective protection used to provide CB protection to field units.

(5) Mask, M24
Obligations incurred for in-house engineering support of M24 Mask used to provide CB protection to air-crew personnel.

(6) Mask, M25A1
Obligations incurred for procurement and in-house engineering support of M25A1 Mask used to provide CB protection for crewmembers of combat vehicles.

(7) Mask, M17A1
Obligations incurred for procurement and in-house engineering support of M17A1 Individual Protective Masks.

b. Production Base Projects

(1) MM1-New Protective Mask
Obligations incurred to verify the production concept for the new protective mask.

(2) MM1-Impregnated Charcoal
Obligations incurred to establish a new process for manufacturing impregnated charcoal used in filters for defensive items.

(3) MM1-Remote Sensing System
Obligations incurred to establish a production process for producing XM21 chemical alarms.

SECTION II

OBLIGATION REPORT ON BIOLOGICAL RESEARCH PROGRAM

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

DEPARTMENT OF THE ARMY

RCS: DD-NR&E (SA) 1065

DESCRIPTION OF RATE EFFORT FOR THE BIOLOGICAL RESEARCH PROGRAM

During FY82, the Department of the Army obligated \$21,554,000 for biological research investigation and the development and test of physical and medical defensive systems.

FUNDS OBLIGATED

	Current Fiscal Year (CFY)	\$ 20,424,000
	Prior Year (PY)	\$ 1,130,000
TOTAL		\$ 21,554,000

Breakdown of Program Areas

1. BIOLOGICAL RESEARCH

a. Basic Research on Life Sciences	CFY PY	\$ 1,709,000 \$ -0-	In-House \$ 592,000 Contract \$ 1,117,000
b. Defense Research Sciences	CFY PY	\$ 309,000 \$ 5,482,000	In-House \$ 3,765,000 Contract \$ 2,026,000
TOTAL: BIOLOGICAL RESEARCH	CFY PY	\$ 7,191,000 \$ 309,000	In-House \$ 4,357,000 Contract \$ 3,143,000

2. DEFENSE SYSTEMS

a. Exploratory Development

	CFY	\$ 9,135,000
	PY	\$ 197,000
		<u>\$ 9332,000</u>

b. Advanced Development

	CFY	\$1,600,000
	PY	\$ 624,000
		<u>\$ 2,224,000</u>

c. Engineering Development

	CFY	\$2,301,000
	PY	\$ -0-
		<u>\$ 2,301,000</u>

d. Testing

	CFY	\$ 197,000
	PY	\$ -0-
		<u>\$ 197,000</u>

TOTAL: DEFENSIVE SYSTEMS

	CFY	\$13,233,000
	PY	\$ 821,000
		<u>\$14,054,000</u>

3. SIMULANT TEST SUPPORT

	\$	-0-
		<u>\$ -0-</u>

4. MANAGEMENT AND SUPPORT

	In-House	\$ 9,248,000
	Contract	\$ 4,806,000
		<u>\$ 14,054,000</u>

EXPLANATION OF OBLIGATION

1. BIOLOGICAL RESEARCH

a. Basic Research in Life Sciences

Support of Biological Defense Materiel: The objective is to provide basic research for new biological and toxin detection warning concepts; to assess residual biological hazard and to maintain a technology base in nonmedical biological defense.

New methods of selective impaction to remove background particles from biological aerosols were investigated. Infrared spectroscopy studies continued for both point and remote detection of biologicals.

Direct biological fluorescence for point detection was investigated studying the level of atmospheric interferences relative to biological responses. Development of simplified immunoassay techniques for class identification of biological organisms was continued. Monoclonal antibodies for use in immunoassay techniques for virus tissue cell growth medium were studied. The use for biological decontamination of electrically charged aerosols of hypochlorous acid was explored.

b. Defense Research Sciences

The Russian-supported use of deadly trichothecene toxins in Indochina led to a comprehensive research program concerned with the medical defense against small molecular weight toxins, such as T-2, and other mycotoxins. The program will provide the science base necessary for the development of systems for the medical diagnosis, treatment and prevention of BW casualties.

Basic research objectives are:

Characterize and determine the physio-chemical nature of militarily important bacterial toxins, how these toxins enter the cell, how they cause cell destruction. Determine initial strategies on safe and effective treatments and preventive measures.

Develop scientific base of medical information to counteract the threats posed by recently discovered bacteria and rickettsia.

Evaluate newly discovered groups of extremely dangerous viruses for their potential threat to IIS forces. These highly lethal but poorly understood viruses must each be studied under laboratory conditions which permit the maintenance, at all times, of rigorous containment techniques to protect "at risk" workers and the surrounding community.

During FY82:

Major anthrax exoproteins and cell wall components were purified and used to produce antibodies, as well as develop new assay methods. A plasmid was discovered which controls the production of anthrax toxin.

Studies on Legionella pneumophila are 95% complete.

A new assay procedure has been developed, based on the observation of symptoms in select in-bred strains of mice. This procedure shows promise in evaluating different kinds of fever vaccine.

The virus which causes Korean Hemorrhagic Fever (KHF) has been isolated, identified and partially characterized. Studies to determine how viruses enter the host cell and establish an infection have achieved considerable success.

Two components of Rift Valley Fever Virus (RVFV) have been isolated and appear to account for almost all of the immunity elicited by the current killed RVF vaccine.

Methods have been developed for the decontamination of small molecular toxins. Mycotoxin toxicity data have been defined in several species of laboratory animals. Initial data indicate that mycotoxins are much less lethal than marine toxins.

Two tissue culture cell lines have been established which allow studies for defining the mechanistic actions of *Botryosphaerum lotinii*.

The primary structure of staphylococcal enterotoxin C (SEC) has been completed. SEC contains five major peptides, not three as previously reported.

2. DEFENSIVE SYSTEMS

a. Exploratory Development

Physical Defense Against Biological Agents: The objective is to evolve improved concepts for automatic detection of biological agents in military operations, to broaden the capability of alarms to detect new agents, and to increase system effectiveness.

It is essential to confirm that a biological agent has been used in order to provide information for subsequent military decisions. The XM2 Sampler, to be fielded with the Biochemical Agent Detector, collects an aerosol sample for specific pathogen identification by the Medical Department. This identification procedure requires several days to complete and is conducted under laboratory conditions. Techniques to reduce identification time to one day are being investigated. The Biological Agent Test Kits (BATEK) are being developed to provide early confirmation of a biological attack. BATEK II will confirm that a live bacteria is present. BATEK III will confirm the presence of a viral aerosol. A 30-month exploratory development contract was awarded in Mar 82. A prototype BATEK model will be tested in FY83. A cooperative program has been established with US Army Medical Research Institute of Infectious Diseases for pathogen testing of BATEK.

Biochemical hazard assessment is necessary to address the problem of residual terrain, material, and personnel contamination after a biological attack. Efforts were concentrated on defining the nature and severity of this residual hazard. A mathematical model was developed to estimate secondary aerosol hazards. Testing is planned for FY83 to compare model prediction with field measured data.

Medical Defense Against Biological Agents: This program supports the development of vaccines, toxoids, and drugs needed to prevent defeat of the US Armed Forces in a non-conventional confrontation with hostile forces.

Objectives:

- Assess aerosols of microbiological organisms or their toxins to determine their potential as biological warfare (BW) agents.
- Develop safe and effective vaccines for those agents and toxoids which are significant BW threats.
- Develop effective antiviral drugs should preventive measures not become available.

Developed ability to identify a BW agent within 6 hours or to diagnose in a rapid and reliable manner a disease produced by a BW agent.

During FY82:

Aerosol stability and respiratory infectivity characteristics of Argentine Hemorrhagic Fever Virus (Junin) were assessed. The effort to develop a live attenuated AHF vaccine, is about 90% complete. This vaccine, when tested in subhuman primates, appears to be safe and effective. The vaccine also confers protection against Bolivian Hemorrhagic Fever virus.

Killed vaccines, such as RVF and Anthrax, were shown to provide good protection to various experimental animals when challenged by conventional routes of administration. Highly purified protective antigen (PA) of Anthrax was determined not significantly better than the currently licensed Anthrax Vaccine.

The evaluation of a monovalent, type E Botulinum Toxoid in human volunteers was recently completed. The toxoid was proved to be safe and effective.

The first large pilot lot of human derived botulism immune globulin (ABCNE) was produced and demonstrated to be safe and efficacious in experimental animals.

The drug 3,4 diaminopyridine (3,4 DAP) was shown to block or at least delay the paralytic action of botulinum toxin. The blockage can be further improved by combining 3,4 DAP with another drug, neostigmine.

Lethal strains of Bacillus Anthracis were discovered to contain a sugar, galactose, whereas, closely related but non virulent bacillus strains do not contain galactose.

An In Vitro neutralization (N) test has been developed which can predict success or failure in heating experimental Lassa Fever in primates. Low N Titers in humans (compared to high N Titers in monkeys or Guinea pigs) explain why sero therapy for Lassa Fever has not been particularly successful in man.

Rift Valley Fever virus has been identified as a member of the Runyavirus family. Studies in a rat model have shown that a single dominant gene determines resistance to the fulminant RVF virus that caused the epidemic in Egypt between 1977-1979.

The Ebola-Marburg group of viruses continues to be a problem for "at risk" workers. Effective treatment for these lethal agents has not been forthcoming, either from the limited supply of immune sera or with the antiviral drug, ribavirin.

A live attenuated dengue-1 vaccine has been successfully developed. Pending final testing in monkeys, this vaccine should be ready for human volunteer studies in FY83-84.

A live attenuated Chikungunya Vaccine under development has been shown to possess desirable characteristics. It should be possible to prepare seeds, a prototype vaccine lot, and begin testing in nonhuman primates in FY83.

Drugs are critically needed for the prevention of viral diseases for which no vaccine is available. In the antiviral drug program conducted during FY82, 27 drugs were screened and evaluated In Vitro and 19 drugs In Vivo. Ribavirin is used as the drug of reference in all evaluations because of its ability to control Lassa Fever in primates. Recently a new class of compounds, the didemmins, have outperformed ribavirin in initial screening.

Entomology studies have shed new light on why some insect species transmit diseases. The amount of virus ingested is critical. For example, mosquitoes transmit RVF virus only when they ingest 6.2 logs of virus.

Technical Assessment of Foreign Biologicals: The objective is the assessment of the biological threat, to the US and its military forces throughout the world, and defensive measures that might be employed in the event of attack.

b. Advanced Development

Drug and Vaccine: This program supports the advanced development effort of vaccine and drugs needed to prevent defeat of the US Armed Forces in a nonconventional confrontation with hostile forces.

Objectives:

Scale-up laboratory processes for vaccine preparation into pilot and industrial-scale operations.

Prepare pilot quantities of specified vaccines for expanded testing and for administration to "at risk" workers.

Prepare and store moderate stocks of specified vaccines which would be used in emergencies.

Document vaccine scale-up from laboratory to industrial scale with descriptive reports such as standard operating procedures, definition of equipment requirements and material balance data. In an emergency, any pharmaceutical manufacturer could use these reports to produce large quantities of the vaccine.

During FY82:

Pilot lots of Tularemia, Dengue 2 and Dengue 4 vaccines were prepared, tested and found to be satisfactory.

An expanded antiviral drug screening program was instituted.

Potency tests were performed on stored VEE, WEE, and RVF vaccines and all tested satisfactorily.

Dengue 1 Antisera were produced, tested, found to be satisfactory and were placed in storage.

c. Engineering Development

Biological Defense Material Concepts: The objective is to complete engineering development of a first generation biological detector and warning system, XM19/XM2, for Army field use. The prototype systems were fabricated and subjected to intensive tests. Based on satisfactory test results, formal independent testing is recommended. Engineering development of the system will be completed. The development acceptance in-process review is planned for Feb 83.

d. Testing

Army Material Suitability Tests: Development testing for the XM19/XM2 Biological Detection and Warning System will be initiated during FY83 at Dugway Proving Ground. Development acceptance in-process review has been scheduled so that retest results will be available at the process review.

DESCRIPTION OF PAA EFFORT FOR THE BIOLOGICAL RESEARCH PROGRAM

No obligations were incurred for procurement of biological defensive equipment.

SECTION III

OBLIGATION REPORT ON ORDNANCE PROGRAM

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

DEPARTMENT OF THE ARMY

RCS DN-DR&E (SA) 1065

DESCRIPTION OF RDT&E EFFORT FOR THE ORDNANCE PROGRAM

During FY82, the Department of the Army obligated \$9,883,000 for general research investigations, development and test of smoke, flame, riot control agents and weapons systems.

FUNDS OBLIGATED

Current Fiscal Year (CFY)	\$ 9,883,000
Prior Year (PY)	<u>-0-</u>
TOTAL	\$ 9,883,000

Breakdown of Program Areas

Smoke and Flame Program	\$ 9,754,000
Riot Control Program	\$ 100,000
Test Support	\$ 29,000

DESCRIPTION OF PAA EFFORT FOR THE ORDNANCE PROGRAM

During FY82, the Department of the Army obligated \$19,848,000 for procurement of smoke/obscurants, riot control agents, weapons systems and other support equipment.

FUNDS OBLIGATED

Current Fiscal Year (CFY)	\$15,135,000
Prior Year (PY)	<u>\$4,173,000</u>
TOTAL	\$19,848,000

Breakdown of Program Areas

Smoke/Obscurants Program	\$19,282,000
Riot Control Program	\$ 21,000
Other Support Equipment	\$ 545,000

SECTION 1

OBLIGATION REPORT OF

CHEMICAL WARFARE LETHAL AND INCAPACITATING AND DEFENSIVE EQUIPMENT PROGRAMS

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

RCS: DD-DR&E (SA) 1065

DEPARTMENT OF THE AIR FORCE

30 SEPTEMBER 1982

OBLIGATION REPORT OF RESEARCH, DEVELOPMENT, TEST AND EVALUATION FUNDS
FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982
REPORTING SERVICE: DEPARTMENT OF THE AIR FORCE
DATE OF REPORT: 30 SEPTEMBER 1982
RCS: DD-DR&E (SA) 1065

DESCRIPTION OF EFFORT RDT&E	FUNDS OBLIGATED (\$ in Millions)		EXPLANATION OF OBLIGATIONS
	PY CFY	IN-HOUSE CONTRACT	
Offensive RDT&E Program			
Research	<u>.000</u> .000	<u>.000</u> .000	
Exploratory Development	<u>.000</u> .000	<u>.000</u> .000	
Advanced Development	<u>.000</u> .000	<u>.000</u> .000	
Engineering Development	<u>.000</u> .100	<u>.000</u> .100	The BIG EYE binary chemical munition is a joint-development program with the Navy acting as lead service. The Air Force tests and certifies the weapon's compatibility with selected Air Force aircraft.
Total Offensive RDT&E	<u>.000</u> .100	<u>.000</u> .100	

OBLIGATION REPORT OF RESEARCH, DEVELOPMENT, TEST AND EVALUATION FUNDS
 FOR THE ANNUAL PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982
 REPORTING SERVICE: DEPARTMENT OF THE AIR FORCE
 DATE OF REPORT: 30 SEPTEMBER 1982
 RCS: DD-DR&E(SA) 1065

DESCRIPTION OF EFFORT	FUNDS OBLIGATED (\$ in millions)	EXPLANATION OF OBLIGATION
	PY CFY	IN-HOUSE CONTRACT
<u>DEFENSIVE EQUIPMENT PROGRAM</u>		
Research	<u>.000</u> .000	<u>.000</u> .000
Exploratory Development	<u>.000</u> .000	<u>.000</u> .000
Advanced Development	<u>.000</u> .000	<u>.000</u> .000
Engineering Development	<u>532</u> 12.894	<u>13,426</u> The program is composed of biological and chemical agent detection, individual protection, collective protection, decontamination and basic operational and medical problems associated with chemical warfare operation
Total Defensive (RDT&E)	<u>532</u> 12.894	<u>.000</u> 13.426

OBLIGATION REPORT OF OPERATIONS AND MAINTENANCE FUNDS
 FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982
 DEPARTMENT OF THE AIR FORCE
 RCS: DD-DRME(SA) 1065

SPECIFICITY OF EFFORT	FUND'S OBLIGATED		EXPLANATION OF OBLIGATION
	(\$ in MILLIONS)		
Contract, C&E, and In-House Programs	PY CEY	IN-HOUSE CONTRACT	
CHEMICAL WARFARE PROGRAM	<u>.000</u> 5.745	<u>5.745</u> .000	
Defensive Equipment Program	<u>.000</u> 5.745	<u>5.745</u> .000	
Protective Clothing and Equipment	<u>.000</u> 5.745	<u>5.745</u> .000	Obligations used for protective clothing and equipment to provide USAF personnel with the capability to operate in a toxic chemical environment.

OBLIGATION REPORT OF PROCUREMENT FUNDS
FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982
DEPARTMENT OF THE AIR FORCE
RCS: DD-DR&E(SA) 1065

DESCRIPTION OF EFFORT <u>Procurement</u>	FUNDS OBLIGATED (\$ in MILLIONS)		EXPLANATION OF OBLIGATION
	PY <u>CFY</u>	IN-HOUSE <u>CONTRACT</u>	
CHEMICAL WARFARE PROGRAM	<u>5.152</u> .000	<u>5.152</u> .000	
Defensive Equipment Program	<u>5.152</u> .000	<u>5.152</u> .000	
Protective Clothing and Equipment	<u>5.152</u> .000	<u>5.152</u> .000	Obligations used for protective clothing and equipment to provide USAF personnel with the capability to operate in a chemical environ- ment.

SECTION 2

OBLIGATION REPORT ON BIOLOGICAL RESEARCH PROGRAM

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

DEPARTMENT OF THE AIR FORCE

RCS: DD-DR&E (SA) 1065

30 SEPTEMBER 1982

N E G A T I V E

SECTION 3

OBLIGATION REPORT ON ORDNANCE PROGRAM

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

DEPARTMENT OF THE AIR FORCE

RCS: DD-DR&E(SA) 1065

30 SEPTEMBER 1982

N E G A T I V E

OBIGATION REPORT ON CHEMICAL WARFARE - BIOLOGICAL RESEARCH PROGRAM

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

DEPARTMENT OF THE NAVY

RCS: DD-DREF(A) 1065

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SECTION 1

OBLIGATION REPORT ON CHEMICAL WARFARE PROGRAM

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

DEPARTMENT OF THE NAVY

RCS: DD-DR&E (A) 1065

OBLIGATION REPORT OF RESEARCH, DEVELOPMENT,
 TEST AND EVALUATION FUNDS FOR THE PERIOD
 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982
 REPORTING SERVICE: DEPARTMENT OF THE NAVY
 DATE OF REPORT: 30 SEPTEMBER 1982
 RCS: DD-DR&E (A) 1065

DESCRIPTION OF EFFORT: R&D&E	FUNDS OBLIGATED (\$ in Millions)			EXPLANATION OF OBLIGATION
	PY CFY	IN-HOUSE CONTRACT		
1. CHEMICAL WARFARE PROGRAM	<u>0</u>	<u>11.018</u>	<u>7.660</u>	During the period 1 October 1981 through 30 September 1982, the Navy obligated \$18,678,000 for research and development efforts.
a. Defensive Equipment Program	<u>0</u>	<u>8.864</u>	<u>7.660</u>	Funds support: (1) Defense requirements analysis. (2) Development of automated chemical/biological detection systems. (3) Joint development/design of critical components for shipboard chemical collective protection systems. (4) Provide U.S. Navy ships with C/W advanced warning systems. (5) Provide U.S. Navy ships with a chemical agent point sampling detector and surface contamination monitor.
(1) Exploratory Development	<u>0</u>	<u>1.564</u>	<u>.212</u>	
(2) Engineering Development	<u>0</u>	<u>7.300</u>	<u>.408</u>	

OBLIGATION REPORT OF RESEARCH, DEVELOPMENT,
 TEST AND EVALUATION FUNDS FOR THE PERIOD
 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982
 REPORTING SERVICE: DEPARTMENT OF THE NAVY
 DATE OF REPORT: 30 SEPTEMBER 1982
 RCS: DD-DRGE(A)1065

DESCRIPTION OF EFFORT: RDT&E (Cont'd)	FUNDS OBLIGATED (\$ in Millions)		EXPLANATION OF OBLIGATION
	PY CFY	IN-HOUSE CONTRACT	
b. Offensive Equipment Program	<u>0</u> <u>9.194</u>	<u>2:154</u> <u>7.040</u>	Funds support: (1) Navy liaison and coordination with other services. (2) Fabrication of Engineering Development models. (3) Conduct of component qualification tests. (4) Completion of aircraft compatibility studies and evaluations. (5) Conduct of toxicity and dissemination test and evaluation.
Eggye Weapon System			
(1) Engineering Development	<u>0</u> <u>9.194</u>	<u>2:154</u> <u>7.040</u>	

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SECTION 2

OBLIGATION REPORT ON BIOLOGICAL RESEARCH PROGRAM

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

DEPARTMENT OF THE NAVY

RCS: DD-DR&E (A) 1065

NEGATIVE

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SECTION 3

OBLIGATION REPORT ON ORDNANCE PROGRAM

FOR THE PERIOD 1 OCTOBER 1981 THROUGH 30 SEPTEMBER 1982

DEPARTMENT OF THE NAVY

RCS: DD-DR&E (A) 1065

NEGATIVE